ISSN: 2347-7431
EPRA International Journal of Climate and Resource Economic Review
-Peer Reviewed Journal
Volume: 13 | Issue:8 |November 2025 || SJIF Impact Factor (2025): 8.54 || Journal DOI: 10.36713/epra1213

THE COST OF CALAMITY: AN EMPIRICAL STUDY OF DISASTER- DRIVEN GOVERNMENT EXPENDITURE

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ABSTRACT----------
This study aims to investigate the extent to which Government Expenditure on Relief and Rehabilitation in India corresponds to the documented intensity of natural disasters from 1990 to 2020. Even after profound fiscal allocations for disaster relief, the relationship between disaster severity and government spending remains blurred, often questioning the efficiency and responsiveness of disaster finance in India. Employing descriptive statistics, correlation, and regression analysis, the research critically examines the impact of Disaster Intensity Index (DII), on government spending for the respective years. The findings uncover implications relating to policy formulation with respect to enhancement of monetary responsiveness and optimal resource allotment for disaster mitigation and recovery.----------

INTRODUCTION

India's geographical location and tropical climate make the country highly vulnerable to floods, cyclones, droughts, and many more such natural calamities. Currently, India ranks among the top five countries most affected by climate- related disasters, as established in the Global Assessment Report 2025 by the UNDRR. Over the period of 30 years, from 1991 to 2020, India has experienced more than 300 major natural catastrophes, resulting in cumulative losses exceeding several lakh crores of rupees. This has a severe impact on the livelihood, infrastructure, as well as the growth and development of the region.

Disaster relief and rehabilitation ensure saving lives, reducing human suffering, restoring normalcy, and building resilience. The Relief phase, also known as the immediate phase, is for providing short- term assistance (in the form of emergency rescue, medical help, and first aid), and preventing further epidemics, or unsafe conditions. The Rehabilitation phase, or the long- term purpose aims to help affected communities recover, rebuild, and regain means of subsistence. This also helps to reduce economic inequalities by prioritizing the most pregnable groups of the society such as women, children, elderly and poor. It reinforces governance and coordination among government authorities, NGOs, and international agencies. Furthermore, it injects demand in the economy and restores public confidence, thus reviving fiscal and economic stability. As emphasized by the National Disaster Management Authority (NDMA) guidelines, the government expenditure on relief and rehabilitation serves as a mechanism for not just immediate recovery, but also for revitalizing fiscal stability and economic confidence in the long run.

While some scholars attribute the increase in natural calamities over time to increased reporting and connectivity, others argue that the rising issue of climate change has further intensified its impact. It has also been reported that disasters fueled by *climate change* are more catastrophic than the scientists initially predicted. Moreover, with additional global warming, the disaster risk will grow even after successful limitation of greenhouse gas emissions.

The bigger question arises when we examine the influence of such recurring disasters on *government expenditure and fiscal priorities* in a developing country like India. Each major disaster compels the government to divert its finances towards immediate relief programs and drives, often pausing long- term developmental projects. This also hinders smooth functioning of pre-established budgetary allocations, leading to higher fiscal burden due to increased borrowing and reduced investment in growth- oriented sectors. Subsequently, disaster management in India has shifted from a reactive to a proactive framework which has improved the risk reduction, preparedness, and resilience- building to minimize the economic shock of such events.

The Comptroller and Auditor General (CAG) and Finance Ministry of India has reported a consequent increase in *"unplanned expenditure"* following natural calamities. These frequent shocks are a test to the government's finance management, as emergency spending often leads to reallocation of resources, deficit expansion, and public debt accumulation. Grieve situations like this challenge the government in balancing short- term humanitarian

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relief with long- term fiscal sustainability. Understanding this relation is crucial for the implementation of India's fiscal strategies in alignment with Sustainable Development Goal (SDG) 13, and the Sendai Framework for Disaster Risk Reduction (2015-30).

Despite extensive scientific study and elaborated literature, limited research in the Indian context has taken place. This study seeks to bridge the gap of the relationship between natural calamities and government expenditure, following the frameworks established by national and global bodies for disaster risk reduction. Using *Disaster Intensity Index (DII)* as the independent variable and *Government Expenditure on Relief and Rehabilitation* as the dependent variable, the research strives to evaluate whether the increased disaster severity translates to proportionally higher relief and rehabilitation spending over time.

REVIEW OF LITERATURE

The significant increase in frequency and intensity of natural disasters across India has prompted economists, policy makers, and economists to evaluate the monetary consequences of such occurrences at the national as well as state levels. Existing literature highlights that disaster- related spending not only reflects immediate relief requirements, but also the economic capacities of governments. Findings in this area reveal the ongoing debates revolving around the efficiency, adequacy, and responsiveness of public spending after calamities.

World Bank. (2022) *Financing Disaster Risk Management: Integrating Resilient Fiscal Systems in India*, highlights the importance of integrating fiscal preparedness into national budgeting and planning systems for the purpose of disaster risk financing. It establishes the theoretical base of how fiscal responses should ideally align with disaster intensity by introducing international mechanisms like Catastrophe Bonds, Contingency Emergency Response Components (CERC), and parametric insurance.

Parida, Y., Sahoo, M., Singh, V., & Dash, D. (2022). *Role of income and government responsiveness in reducing the death toll from floods in Indian states. Scientific Reports*, 12(17382), examines the national evidence on Income, Government Responsiveness, and Flood Fatalities in India. It reveals the nuanced non- linear relationships between fiscal capacity, public spending, and disaster outcomes through the inverted U-shaped effect and lays empirical groundwork showing government expenditure impacts disaster mortality indirectly.

IIT Bombay. (2024). *Natural disasters and climate change have long-term impact on state finances.* Indian Institute of Technology Bombay Research Highlights, is recent quantitative research which underscores the prolonged fiscal strain that disasters exert on Indian state finances. This also implied that disproportionately severe impact in coastal and disaster- prone states, heightens the public expenditure and reduces the state revenues, thus increasing fiscal deficits.

Carbon Impacts. (2025). *Escalating expenditures, widening deficits: How climate change-driven disasters impact state coffers,* advocates the creation of climate budget statements and special reserve funds to overcome the unplanned relief expenditure, deficit expansion, and disruptions to capital allocations; by unfolding the links between fiscal instability and environmental stressors.

Centre for Budget and Governance Accountability (CBGA). (2016). *Public Policy Towards Natural Disasters in India.* New Delhi: CBGA India, establishes the institutional background for analysing expenditure data which revealed the persistent gaps in India's historical disaster policy. This also highlights the imbalance stating over 80% spent on post- disaster relief, which is a significantly huge figure, as opposed to minimal pre- relief investment.

OBJECTIVES OF THE STUDY

1. To analyse the relationship between the Disaster Intensity Index (DII) and Government Expenditure on Relief and Rehabilitation in India from 1991-2020.
2. To examine the trend and growth patterns of government expenditure on disaster relief over the past three decades.
3. To evaluate whether increased disaster intensity leads to subsequent higher fiscal spending by the central or state governments.
4. To assess the efficiency and responsiveness of government expenditure in relation to the frequency and severity of natural calamities.

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5. To establish the statistical significance of correlation and regression results between the variables using Excel- based analysis.
6. To identify policy gaps and further suggest ways to improve fiscal preparedness and equitable fund allocation for disaster management.

RESEARCH QUESTION

Is there a significant relationship between the Magnitude of Natural Calamities and Government Expenditure on Relief and Rehabilitation; and whether or not, the amount allocated for relief through the Calamity Relief Fund (CRF) or the National Disaster Response Fund (NDRF), is influenced by the scale of proportionate financial losses over time?

RESEARCH METHODOLOGY

This study uses the quantitative research approach based on Secondary data from the year 1991 to the year 2020. The data is sourced from the official website of EM-DAT, along with Government- issued reports through CRF/NDRF.

It examines the economic relationship between the independent variable- Disaster Intensity Index (Variable X), and the dependent variable- Government Expenditure on Relief and Rehabilitation (Variable Y), using descriptive statistics, correlation, and regression analysis, and interprets the results in accordance with the strength and significance of the statistical association, thereby determining the responsiveness of government expenditure to disaster magnitude.

HYPOTHESIS

Null Hypothesis (H_0): There is *no significant relationship* between the magnitude of Disaster Damage, and Government Expenditure on Relief and Rehabilitation.

Alternate Hypothesis (H_1): There is a *significant positive relationship* between the magnitude of Disaster Damage, and Government Expenditure on Relief and Rehabilitation.

FINDINGS & REASONINGS

To begin with, the research timeline is determined, in this particular case- a period of 30 years is taken into consideration, from the year 1991 to the year 2020. After the determination of the timeline for study, data is collected for both, the independent variable- Disaster Intensity Index (Variable X), and the consequent dependent variable- Government Expenditure on Relief and Rehabilitation (Variable Y).

Year	Disaster Intensity Index (DII)
1991	0.053
1992	0.021
1993	0.302
1994	0.051
1995	0.079
1996	0.067
1997	0.07
1998	0.183
1999	0.222
2000	0.141
2001	0.359
2002	0.381
2003	0.044
2004	0.314
2005	0.108
2006	0.029
2007	0.072
2008	0.042
2009	0.046
2010	0.025
2011	0.029
2012	0.013

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2013	0.129
2014	0.023
2015	0.387
2016	0.022
2017	0.059
2018	0.053
2019	0.06
2020	0.056

Table 1.1 Disaster Intensity Index (DII) over the period of 1991-2020

Source: EM-DAT

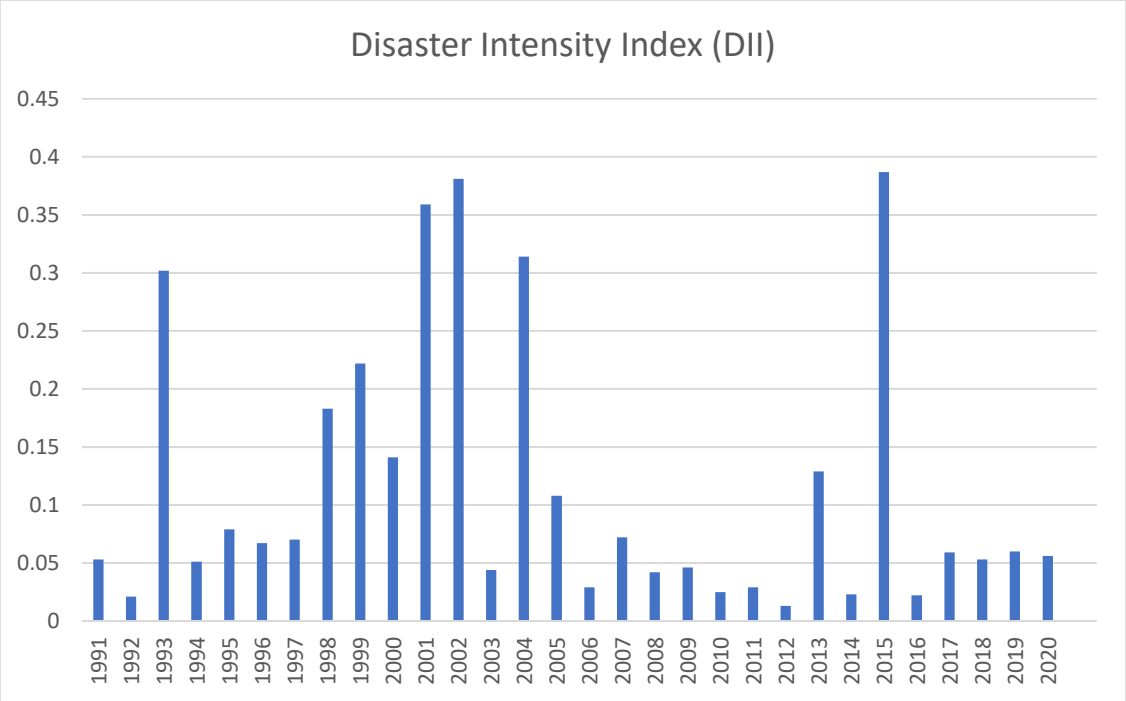


Figure 1.1 Disaster Intensity Index (DII) curve for the given period

Source: Author's own compilation

The fluctuation in the above gathered data shows the instability in disaster intensity over the given time period which implies the high variability in disaster intensity from year to year, demonstrating the oscillating pattern of occurrence and scale of disasters, depending on climatic, geographical, and seasonal factors. The data underlines India's *cyclical disaster pattern,* emphasising on the intense episodes which cluster around multi- year intervals, then followed by recovery phases.

On the other hand, Government Expenditure on Relief and Rehabilitation represents the *financial outlay* corresponding to immediate response, recovery, and stabilisation of communities affected by natural calamities. The numerical data for the same is shown in Table 1.2.

Year	Government Expenditure on Relief and Rehabilitation
1991	5859.57
1992	5525.46
1993	136890.33
1994	3286.19
1995	5155.46
1996	35785.62
1997	4092.97
1998	15511.99
1999	45111.7

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2000	21794.27
2001	42304.41
2002	13420.01
2003	8362.38
2004	50471
2005	93034.5
2006	42200.38
2007	4552.64
2008	1981.47
2009	31980.52
2010	24731.96
2011	22676.78
2012	2666.97
2013	25611.12
2014	248739.68
2015	73575.28
2016	26913.71
2017	21673.63
2018	61051.95
2019	115925.94
2020	256273.26

Table 1.2 Government Expenditure on Relief and Rehabilitation over the period of 1991-2020
Source: EM-DAT

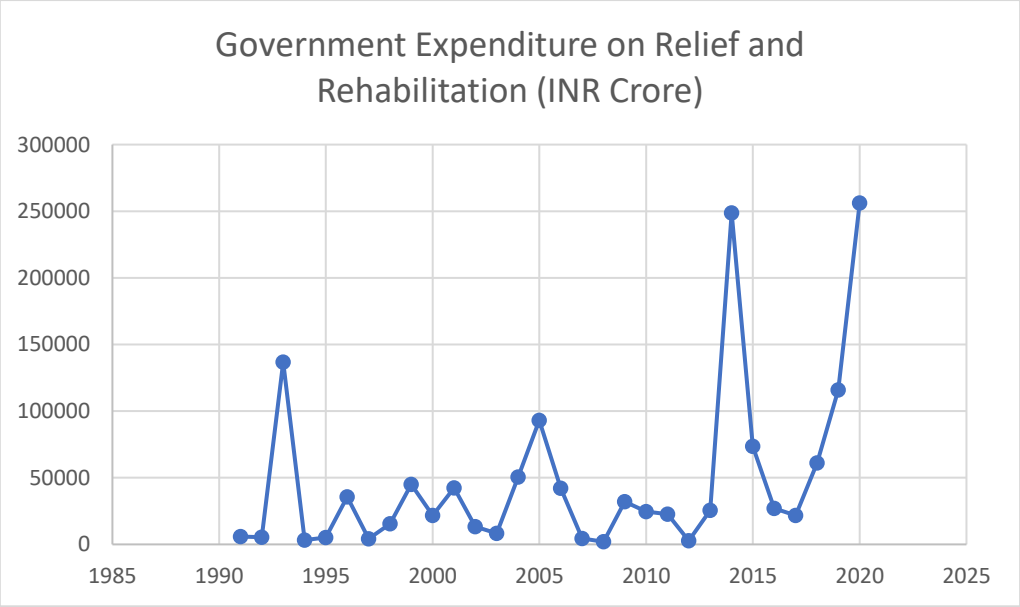


Figure 1.2 Government Expenditure on Relief and Rehabilitation curve for the given period
Source: Author's own compilation

The fluctuating trend in this data indicates that allocations are influenced not only by disaster magnitude but also by fiscal constraints, administrative procedures, and fund availability. There is a visible improvement in the years following 2015 which show better financial planning, institutional mechanisms, and mitigation policies.

	Variable X: Disaster Intensity Index (DII)	**Variable Y: Government Expenditure on Relief and Rehabilitation**
Variable X: Disaster Intensity Index (DII)	1	
Variable Y: Government Expenditure on Relief and Rehabilitation	0.044836	1

Table 1.3 Correlation

Source: Author's own compilation

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The value 0.044836 is very close to zero, indicating no statistically significant correlation. The relationship between both the variables suggests little to no linear association between disaster intensity and fiscal response over the determined time period. This shows that changes in disaster intensity do not correspond to meaningful or consistent changes in proactive government spending during the years studies. The value further proves the ground reality of influence of other factors such as administrative decisions, fiscal policy, or delayed responses, in disaster expenditure, in place of severity of the disasters themselves. It also suggests that Indian Government disaster aid allocations may depend more on fiscal constraints, bureaucracy, or other administrative decisions, more than the indicated severity of the calamities.

To proceed with additional analysis, the regression model for the same data is provided below in Table 1.4:

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.024765283
R Square	0.000613319
Adjusted R Square	-0.035079062
Standard Error	65689.6641
Observations	30

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	74148973.34	74148973	0.017183	0.896644796
Residual	28	1.20824E+11	4.32E+09		
Total	29	1.20898E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	48903.0324	16849.26108	2.902384	0.007141	14388.88567	83417.18	14388.89	83417.18
0.053	13592.51694	103691.7855	0.131086	0.896645	-198810.4771	225995.5	-198810	225995.5

Table 1.4 Regression Analysis

Source: Author's own compilation

This regression analysis depicts that there is no meaningful relationship between the Disaster Intensity Index (DII) and Government Expenditure on Relief and Rehabilitation over the time period studied. The R Square value is practically zero (0.0006), showing that the DII accounts for less than 0.1% of the fluctuation in government expenditure and thus, it does not help predict the estimated monetary value. The slope intercept for DII (0.053) is statistically insignificant, indicating towards negligible and unreliable change in government spending, for every unit increase in DII.

In reality, this result suggests that, government relief expenditure in India is generally unresponsive to the measured magnitude of natural disasters. Therefore, the numeric findings lead to the acceptance of the Null Hypothesis (H_0) due to insignificant relationship between the two variables.

CONCLUSION & POLICY IMPLICATIONS

Although both the variables instill theoretical relation among them, there is no statistical evidence confirming the proportionate increase. Due to this, the Null Hypothesis (H_0) is accepted in place of the Alternate Hypothesis (H_1). The historical pattern as shown suggests that government spending in response to natural catastrophes is shaped by factors beyond the measured disaster impact- such as administrative delays, fiscal limitations, political discretions, or lagged funding. The result also aligns with the findings of recent literature implying that Indian disaster response is mostly reactive, not anticipatory or data-driven.

This study provides additional longitudinal evidence for the Indian sub-continent, emphasizing methodological rigor, and also fills existing gaps in the empirical literature. Key areas with potential investigative scope include state- level variation, time- lagged effects, or qualitative examination of decision- making in fund allocation.

Given the absence of a strong correlation between the Disaster Intensity Index (DII) and Government Expenditure on Relief and Rehabilitation, there is an alarming need for more data- driven and responsive funding mechanisms to ensure that expenditure matches disaster severity in real time. Strengthening institutional coordination between concerned authorities, center, and states is required to minimize bureaucratic or political delays in taking corrective actions. In addition to this, respective authorities must focus on enhancing transparency in relief management and budgeting through periodic reviews and updates on fund allocation, to rule out fiscal uncertainty. Policies encouraging greater fiscal autonomy and innovation in the hands of the state governments, such as contingency reserves and disaster risk insurance, must be introduced to strengthen the overall disaster management framework in India, in compliance with the leading global practices.

Effective disaster management should be treated as a societal imperative, rather than a mere policy goal. This study underscores the pressing need for evolution of India's disaster relief frameworks towards more evidence-based responses; safeguarding uncountable lives and livelihoods.

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